



## USB to FIFO Parallel Interface Module

The DLP-USB245M is the 2nd generation of DLP Design's USB adapter. This device adds extra functionality to it's DLP-USB1 predecessor with a reduced component count and a new low price.

### DLP-USB245M FEATURES

- Send / Receive Data over USB at up to 1 M Bytes / sec
- 384 byte FIFO Transmit buffer / 128 byte FIFO receive buffer for high data throughput
- Simple interface to CPU or MCU bus
- No in-depth knowledge of USB required as all USB Protocol is handled automatically within the module
- FTDI's Virtual COM port drivers eliminate the need for USB driver development in most cases.
- Integrated 3.3v Regulator – No External Regulator Required
- Integrated Power-On-Reset circuit
- Integrated 6MHz – 48Mhz clock multiplier PLL
- USB Bulk or Isocronous data transfer modes
- 4.4v - 5.25v Single Supply taken directly from the USB port
- UHCI / OHCI / EHCI host controller compatible
- USB 1.1 and USB 2.0 compatible
- USB VID, PID, Serial Number and Product Description
- Strings stored in on-board EEPROM.
- EEPROM programmable on-board via USB
- VIRTUAL COM PORT ( VCP ) DRIVERS for
  - Windows 98 and Windows 98 SE
  - Windows 2000 / ME / XP
  - Windows CE \*\*
  - MAC OS-8 and OS-9
  - MAC OS-X
  - Linux 2.40 and greater
- D2XX ( USB Direct Drivers + DLL S/W Interface )
  - Windows 98 and Windows 98 SE
  - Windows 2000 / ME / XP

[ \*\* = In planning or under development ]

### APPLICATION AREAS

- Rapid Prototype Development
- USB ISDN and ADSL Modems
- High Speed USB PDA Interface
- USB Interface for Digital Cameras
- USB Interface for MP3 players
- High Speed USB Instrumentation
- USB Smart Card Readers
- Set Top Box (S.T.B.) PC-USB interface
- USB Hardware Modems
- USB Wireless Modems
- USB Bar Code Readers

## DRIVER SOFTWARE

FTDI's VCP (Virtual COM Port) driver executable files are provided royalty-free on the condition that they are only used with designs incorporating an FTDI device (ie the FT245BM and DLP-USB245M). The latest version of the drivers can be downloaded from [dlpdesign.com](http://dlpdesign.com) or [ftdichip.com](http://ftdichip.com).

The VCP driver download file is a combined set of drivers for Windows '98, Windows ME and Windows 2000/XP. Unzip the file to a blank floppy disk or folder on your PC. The drivers can co-exist on the same floppy disk or folder since the INF files determine which set of drivers to load for each operating system version. Once loaded, the VCP drivers allow your application software, running on the host PC, to communicate with the DLP-USB245M as though it were connected to a COM (RS-232) port.

In addition to VCP drivers, FTDI's "D2XX Direct Drivers" for Windows offer an alternative solution to the VCP drivers that allows application software to interface with the FT245BM device using a DLL instead of a Virtual Com Port. The architecture of the D2XX drivers consists of a Windows WDM driver that communicates with the FT245BM device via the Windows USB Stack and a DLL that interfaces the Application Software (written in VC++, C++ Builder, Delphi, VB etc...) to the WDM driver. An INF installation file, uninstaller program and D2XX programmers guide complete the package.

The D2XX Direct Drivers add support for simultaneous access and control of multiple FT245BM devices. The Extended Open function (FT\_OpenEx ) allows the device to be opened either by it's Product Description or by Serial Number, both of which can be programmed to be unique. The List Devices function (FT-ListDevices) allows the application software to determine which devices are currently available for use, again by product description or by serial number.

Several new features have been recently added to the D2XX drivers. Functions are provided to program the EEPROM (FT\_EE\_Program), and read the EEPROM (FT\_EE\_Read). Unused space in the EEPROM is called the User Area (EEUA), and functions are provided to access the EEUA. FT\_EE\_UASize gets its size, FT\_EE\_UAWrite writes data into it, and FT\_EE\_UARead is used to read its contents.

Download FTDI Application Notes AN232-03, AN232-05, AN232-06, and AN232-07 for detailed instructions on how to install and remove the drivers.

- ected to do so.

VID and PID. Step 5 is optional and

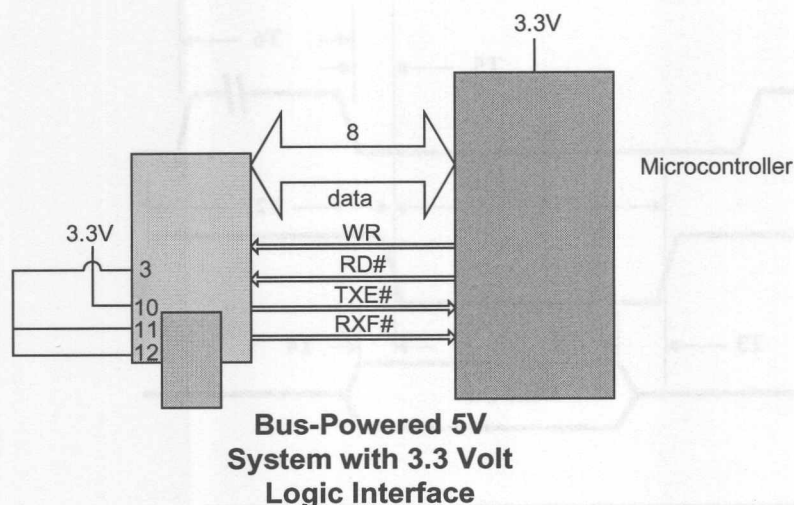
se with the DLP-USB232M module

and description strings stored in the



9	<b>SND/WUP</b> (In) If the DLP-USB245M is in USB suspend, a positive edge on this pin (WAKEUP) initiates a remote wakeup sequence. If the device is active (not in suspend) a positive edge on this pin (SEND) causes the data in the write buffer to be sent to the PC on the next USB Data-In request regardless of how many bytes are in the buffer.
10	<b>VCC-IO</b> (In) 3.0 volt to +5.25 volt VCC to the UART interface pins 10..12, 14..16 and 18..25. When interfacing with 3.3v external logic connect VCC-IO to the 3.3v supply of the external logic, otherwise connect to VCC to drive out at 5v CMOS level. This pin must be connected to VCC from the target electronics or EXTVCC.
11	<b>EXTVCC</b> – (In) Use for applying main power (4.4 to 5.25 Volts) to the module. Connect to PORTVCC if module is to be powered by the USB port (typical configuration)
12	<b>PORTVCC</b> - (Out) Power from USB port. Connect to EXTVCC if module is to be powered by the USB port (typical configuration). 500mA maximum current available to USB adapter and target electronics if USB device is configured for high power.
13	<b>RXF#</b> - (Out) When low, at least 1 byte is present in the FIFO's 128-byte receive buffer and is ready to be read with RD#. RXF# goes high when the receive buffer is empty.
14	<b>TXE#</b> - When high, the FIFO's 385 byte transmit buffer is full, or busy storing the last byte written. Do not attempt to write data to the transmit buffer when TXE# is high.
15	<b>WR</b> (In) When taken from a high to a low state, WR reads the 8 data lines and writes the byte into the FIFO's transmit buffer. Data written to the transmit buffer is sent to the host PC within the TX buffer timeout value ( default 16mS ) and placed in the RS-232 buffer opened by the application program. Note : The FT245BM allows the TX buffer timeout value to be reprogrammed to a value between 1 and 255mS depending on the applicaton requirement, also the SND pin can be used to send any remaining data in the TX buffer regardless of the timeout value.
16	<b>RD#</b> (In) When pulled low, RD# takes the 8 data lines from a high impedance state to the current byte in the FIFO's receive buffer. Taking RD# high returns the data pins to a high impedance state and prepares the next byte (if available) in the FIFO to be read.
17	D7 I/O Bi-directional Data Bus Bit # 7
18	D6 I/O Bi-directional Data Bus Bit # 6
19	D5 I/O Bi-directional Data Bus Bit # 5
20	D4 I/O Bi-directional Data Bus Bit # 4
21	D3 I/O Bi-directional Data Bus Bit # 3
22	D2 I/O Bi-directional Data Bus Bit # 2
23	D1 I/O Bi-directional Data Bus Bit # 1
24	D0 I/O Bi-directional Data Bus Bit # 0

Figure 3



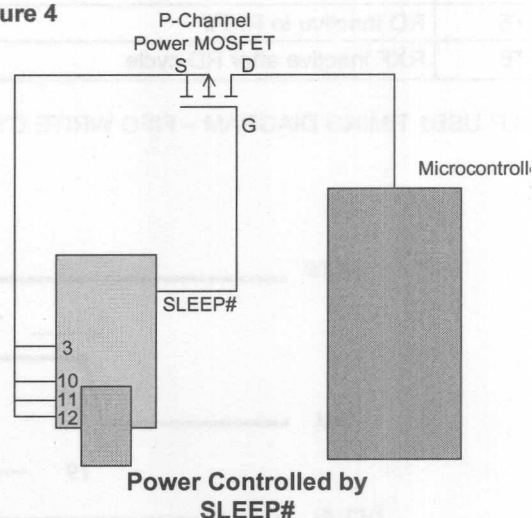
**Figure 3** shows how to configure the DLP-USB245M to interface with a 3.3v logic device. In this example, the target electronics provides the 3.3 volts via the VCCIO line (pin 10) which in turn will cause the FIFO interface IO pins to drive out at 3.3v level.

#### Bus Powered Circuit with Power Control

USB Bus powered circuits need to be able to power down in USB suspend mode in order to meet the  $\leq 500\mu\text{A}$  total suspend current requirement (including external logic).

**Figure 4** shows how to use a discrete P-Channel Logic Level MOSFET to control the power to external logic circuits. A suitable device could be a Fairchild NDT456P or equivalent. This configuration is suitable for powering external logic where the normal supply current is  $\leq 100\text{mA}$  and the logic to be controlled does not generate an appreciable current surge at power-up. For power switching external logic that takes over 100mA or generates a current surge on powerup we

Figure 4

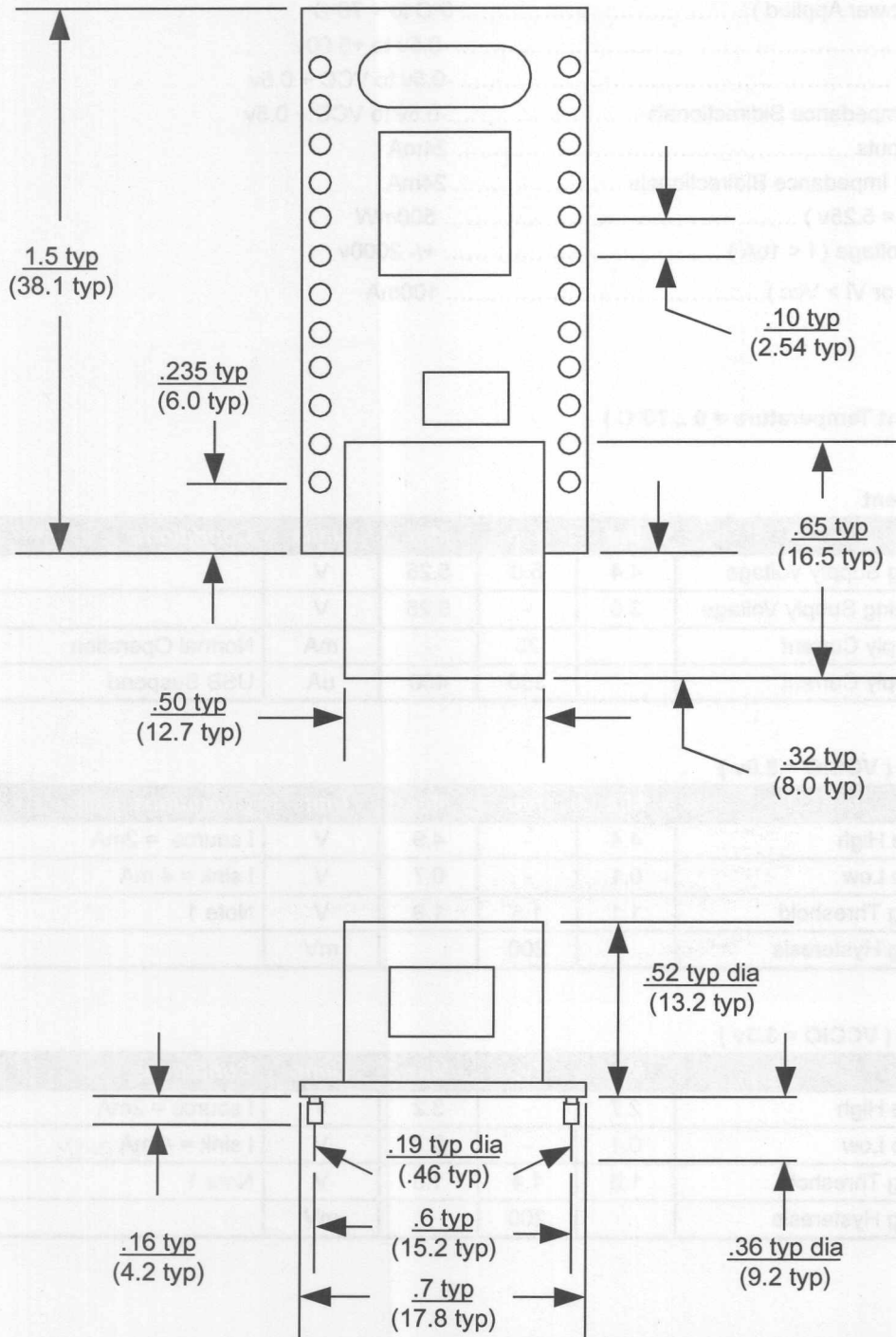


recommend that a dedicated power switch i.c. with inbuilt "soft-start" is used instead of a MOSFET. A suitable power switch i.c. for such an application would be a Micrel ([www.micrel.com](http://www.micrel.com)) MIC2025-2BM or equivalent.

Please note the following points in connection with power controlled designs –

- The logic to be controlled must have it's own reset circuitry so that it will automatically reset itself when power is re-applied on coming out of suspend.
- Set the soft pull-down option bit in the FT232BM EEPROM.
- For 3.3v power controlled circuits VCCIO must not be powered down with the external circuitry (PWREN# gets it's VCC supply from VCCIO).

**Mechanical Drawings (PRELIMINARY)**  
**Inches(millimeters) unless otherwise noted**



**RESET# Pin Characteristics**

Parameter	Description	Min	Typ	Max	Units	Conditions
<b>V<sub>in</sub></b>	Input Switching Threshold	1.1	1.5	1.9	V	Note 1
<b>V<sub>Hys</sub></b>	Input Switching Hysteresis		200		mV	

Note 1 – Inputs have an internal 200k pull-up resistor to VCCIO.

**RSTOUT Pin Characteristics**

Parameter	Description	Min	Typ	Max	Units	Conditions
<b>V<sub>oh</sub></b>	Output Voltage High	3.0	-	3.6	V	I source = 2mA
<b>I<sub>ol</sub></b>	Leakage Current Tri-State	-	-	5	uA	

**USB IO Pin Characteristics**

Parameter	Description	Min	Typ	Max	Units	Conditions
<b>UV<sub>oh</sub></b>	IO Pins Static Output ( High )	2.8		3.6v	V	RI = 1k5 to 3V3Out ( D+ ) RI = 15k to GND ( D- )
<b>UV<sub>ol</sub></b>	IO Pins Static Output ( Low )	0		0.3	V	RI = 1k5 to 3V3Out ( D+ ) RI = 15k to GND ( D- )
<b>UV<sub>se</sub></b>	Single Ended Rx Threshold	0.8		2.0	V	
<b>UCom</b>	Differential Common Mode	0.8		2.5	V	
<b>UVDif</b>	Differential Input Sensitivity	0.2			V	
<b>UDrvZ</b>	Driver Output Impedance	29		44	ohm	Note 2

Note 2 – Driver Output Impedance includes the external 27R series resistors on USBDP and USBDM pins.



# Appendix A – DLP USB245M Schematic

